MERRIMACK VALLEY FLOOD CONTROL

SPECIFICATIONS

FOR

FURNISHING

PUMPING EQUIPMENT

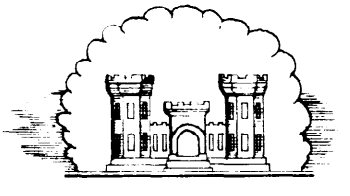
FOR

FLOOD PROTECTION

NASHUA

NEW HAMPSHIRE

1946



CORPS OF ENGINEERS, U.S. ARMY

U.S. ENGINEER OFFICE, BOSTON, MASS.

Specification Serial No. 19-023-46-102

MERRIMACK VALLEY FLOOD CONTROL

SPECIFICATIONS

FOR

THE FURNISHING OF

PUMPING EQUIPMENT FOR FLOOD PROTECTION

NASHUA, NEW HAMPSHIRE

JUNE 1946

CORPS OF ENGINEERS, U. S. ARMY
U. S. ENGINEER OFFICE BOSTON, MASS.

Bid No._____ Bidder_____
(Do not write above this line)

Serial No. 19-023-46-102

INVITATION FOR BIDS
(REVISED)

(SUPPLY CONTRACT)

WAR DEPARTMENT
U. S. ENGINEER OFFICE
3d Floor, Park Square Bldg.
31 St. James Avenue
Boston 16, Mass.

25 June 1946

Project: Furnishing Pumping Equipment for
Flood Protection, Nashua, N. H.

1. Sealed bids in duplicate will be received until 2:00 P.M., Eastern Daylight Saving Time, 22 July 1946, for furnishing all plant, labor, and materials and performing all work in strict accordance with the specifications, schedules, and drawings designated in Paragraph SC-2 of these specifications for the design, manufacture, and delivery f.o.b. railroad cars at Nashua, New Hampshire, or f.o.b. truck at the Pumping Station located at the E. Hollis St. Bridge, Nashua, New Hampshire, two (2) thirty (30) inch storm water pumps, two (2) electric motor drives for the thirty (30) inch pumps, one (1) 4,500 g.p.m. sewage pump, one (1) electric motor drive for the 4,500 g.p.m. pump and all required discharge piping, gate valves, flap valves and fittings.

2. Bids will be submitted in sealed envelopes upon the attached Government form of bid, and marked in the upper hand corner "Bid under Serial No. 19-023-46-102 to be opened 22 July 1946, Attention: Chief, Contracts and Procurement Branch," the serial number indicating the project for which the bid is submitted. The bidder who is awarded the contract will be required to execute the standard Government War Department contract form for supply (W.D. Contract Form No. 1) a copy of which is attached hereto, or if not attached, a copy thereof is available at the U. S. Engineer Office designated above.

3. Bidders may submit separate bids for Item No. 1 or for Item No. 2 or bids for both Items Nos. 1 and 2.

4. The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any

informality in bids received, and to accept or reject any or all items of any bid, unless such bid is qualified by specific limitation.

5. Bid bond on U. S. Standard Form No. 24 (or U. S. Standard Form No. 34 - Annual Bid Bond) in 20% of the bid price will be required with each bid.

6. Bidders should carefully examine the drawings and specificiations and fully inform themselves as to all conditions and matters which can in any way affect the work or the cost thereof. Should a bidder find discrepancies in, or omissions from, the drawings, specifications, or other documents, or should he be in doubt as to their meaning, he should at once notify the contracting officer and obtain clarification prior to submitting his bid.

7. Each bidder shall submit with his bid the following drawings and data:

(a) General drawings, including axial cross-sectional drawings and photographs or cuts, showing the general construction and over-all and governing dimensions of the equipment proposed.

(b) General information as to the materials to be used for the principal parts of the equipment, the convenience and methods of assembling and dismantling, and such other information as may be needed to show that the equipment proposed meets the requirements of the specifications.

(c) Data called for on the Data Sheets attached to the Bid Form.

(d) Expected performance curves showing the anticipated discharge, efficiency, and horsepower for net heads ranging from 0 to 22 feet.

8. The bidder may submit in his bid equipment and materials differing from those specified, provided that differences are stated clearly in the bid and that the substitutes offered conform in all essential requirements to the equipment or materials specified. If, in the opinion of the Government, the equipment and materials offered for substitution are equal to or better for the purpose required than those specified, approval of the substitute items offered will be given consideration.

9. Each bidder shall enclose with his bid a statement of whether he is now or ever has been engaged in any work similar to that covered by the specifications herein, the year in which such work was performed and the manner of its execution, and giving such other information as will tend to show the bidder's ability to prosecute the required work.

10. Any bid which is conditioned upon the Government agreeing to the use of a price adjustment clause will be rejected.

C. T. HUNT
Colonel, Corps of Engineers
District Engineer

F.N.P.

Engineer Form 1448
Approved 20 Aug. 1945

capable of adapting comprise residen

and only these organisms

Serial No. 19-023-46- 102
Date 25 June 1946

WAR DEPARTMENT
CORPS OF ENGINEERS
U. S. ENGINEER OFFICE
PARK SQUARE BUILDING
BOSTON, MASS.

PART I - STATEMENT OF WORK

SW-1. DESCRIPTION OF WORK.

(a) Work to be Done. The contractor shall furnish all labor, materials, plant, and equipment to perform, in strict accordance with the detailed requirements of these specifications, all the work necessary to complete the manufacture, to prepare and load for shipment, and to deliver f.o.b. railroad cars at Nashua, New Hampshire or f.o.b. truck at the Pumping Station located at the E. Hollis St. Bridge, Nashua, New Hampshire, two (2) thirty (30) inch storm water pumps, two (2) electric motor drives for the thirty (30) inch pumps, one (1) 4,500 g.p.m. sewage pump, one (1) electric motor drive for the 4,500 g.p.m. pump and all required discharge piping, gate valves, flap valves and fittings.

(b) Location.- The site of the work contemplated by these specifications is located in a pumping station to be constructed near the E. Hollis Street Bridge, Nashua, Hillsboro County, New Hampshire. The site of the work is approximately one mile from the center of Nashua.

(c) Appropriation.- 21X3113 Flood Control General, First Deficiency Appropriation Act 1946. Approved 28 December 1945.

(d) Authority.- The work provided for herein is authorized by the Flood Control Act, approved 22 June 1936 (Public No. 738-74th Congress) and the Flood Control Act, approved 28 June 1938 (Public No. 761-75th Congress).

Engineer Form No. 125
Rev. 1 Feb. 1946

F.N.P.

PART II - GENERAL CONDITIONS

GC-1. SCOPE OF WORK. The work to be performed under this contract consists of furnishing all labor, materials, and equipment to perform the work required by Article I of the contract, in strict accordance with the specifications and drawings which are made a part hereof. The equipment furnished shall be complete, with all parts in good working order, of good materials, and with accurate workmanship, skillfully fitted, and properly connected and put together. All work, materials, and services not expressly called for in the specifications or shown on the drawings, but which are necessary for complete and proper operation of the equipment, shall be performed and furnished by the contractor at no increase in cost to the Government.

GC-2. PROTECTION OF MATERIALS AND WORK. The contractor shall at all times take care to protect and preserve all materials, supplies, and equipment of every description (including property which may be Government furnished or owned) and all work performed. All reasonable requests of the contracting officer to inclose or specially protect such property will be complied with. If, as determined by the contracting officer, material, equipment, supplies, and work performed are not adequately protected by the contractor, such property may be protected by the Government and the cost thereof may be charged to the contractor or deducted from any payments due to him. All machinery, materials, and articles in complete or incomplete state for which partial or complete payment has been made prior to delivery shall be adequately protected by the contractor from loss, and from corrosion and any and all other forms of damage.

N.P.

PART III

SPECIAL CONDITIONS

(INDEX)

PART III. SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION.- The contractor will be required to commence work under this contract within fifteen (15) calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to make delivery of the items within the number of calendar days after said date of receipt of notice to proceed, as follows:

Item No. 1 - 240 calendar days
Item No. 2 - 360 calendar days

SC-2. CONTRACT DRAWINGS AND SPECIFICATIONS.- Five (5) sets of contract drawings and specifications will be furnished the contractor without charge. Additional sets will be furnished on request at the cost of reproduction.

The work shall conform to the applicable portions of the following contract drawings, all of which form a part of these specifications and are available in the U. S. Engineer Office, 3d Floor, Park Square Building, 31 St. James Avenue, Boston, Massachusetts.

DRAWING NO.	DESCRIPTION
File No. M35-26/1	Project Location and Index for Pumping Equipment
M35-26/2	Pumping Station - Arrangement of Equipment
M35-26/3	Pumping Station Area - Plan and Sections
M35-26/4	Pumping Station Superstructure - Plan, Elevations and Plumbing
M35-26/5	Pumping Station Substructure - Masonry Details
M35-26/6	Pumping Station Substructure - Pump Motor Supports
M35-26/7	Pumping Station - Electrical System

The work shall also conform to such additional drawings in explanation of details as may be furnished by the contracting officer from time to time during construction.

Drawing No. M35-26/2 shows information pertinent to the pumping equipment and shows the arrangement of other types of equipment which will be installed in the Pumping Station by others. The remaining drawings show the project location and the physical condition in and around the Pumping Station which will be constructed by others.

SC-3. CONTRACTOR'S DRAWINGS.- The contractor shall submit to the contracting officer for approval within thirty (30) calendar days after the date of receipt by him of notice to proceed four (4) copies of all shop drawings as called for under the various headings of these specifications. Before delivery of the equipment the contractor shall furnish to the contracting officer 6 prints of erection drawings indicating the relationship of all match marks painted or stamped on the several parts. These drawings shall be complete and shall contain all required detailed information for assembly and erection of the equipment by others. If approved by the contracting officer, each copy of the shop drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the contracting officer. Three (3) sets of all shop drawings will be retained by the contracting officer and one (1) set will be returned to the contractor. The approval of the drawings by the contracting officer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any error which may exist as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of the equipment and accessories.

SC-4. BONDS.- The contractor agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard Form No. 25-B. The penal sum of such performance bond will be 50% of the contract price.

Any bonds required hereunder will bear the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

SC-5. PATENT INDEMNITY.- The contractor agrees to indemnify the Government, its officers, agents, servants and employees, against liability including costs and expenses for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be ordered to be kept secret under the provisions of the Act of October 6, 1917, as amended, 35 U. S. C. 42) occurring in the performance of this contract or arising (in respect only of inventions which are actually embodied in items manufactured or supplied hereunder, or are involved in the use, unless there be more than one practicable use, of such items) by reason of the use or disposal of such items by or for the account of the Government.

SC-6. SHIPMENT.- (a) Material and machinery shall be furnished and delivered f.o.b. railroad cars at Nashua, New Hampshire or f.o.b. truck at the Pumping Station named in Paragraph SW-1 by the contractor. The contractor shall prepare and load all material and

articles for shipment in such a manner as to protect them from damage in transit, and shall be responsible for and make good any and all damage due to improper preparation or loading for shipment. Where necessary, heavy parts or machines shall be mounted on skids or shall be crated, and any articles or materials that might otherwise be lost shall be boxed or wired in bundles and plainly marked for identification. All material shall be so loaded that it will not shift or become damaged during hauling. All parts exceeding two hundred (200) pounds gross weight shall be prepared for shipment so that slings for handling by crane may be readily attached while the parts are on the car. Boxed parts, where it is unsafe to attach slings to the box, shall be packed with slings attached to the part, the slings to project through the box or crate so that attachment to the hoisting equipment can be readily made.

(b) As soon as each shipment is made, the contractor shall furnish to the contracting officer shipping notices on which shall be shown, in addition to the usual data, a description of the article furnished and the item number of the contract schedule to which the article applies; also the shipping weight of each item.

(c) The Government will accept delivery of the materials and equipment whenever completed and delivered f.o.b. railroad cars at Nashua, New Hampshire or f.o.b. truck at the Pumping Station by the contractor, but the contractor shall notify the contracting officer at least 30 days in advance as to the expected shipping dates.

(d) All crates, packages and items shall be properly tagged to indicate contents or the article. Small parts and delicate items shall be packaged. Bolts, nuts, washers and miscellaneous small articles shall be bagged or packaged. The contractor shall ship the equipment in subassemblies, marked with appropriate numbers for identification with symbols on the erection drawings, so that the equipment may be handled and placed in position by the erection contractor without the necessity of further dismantling.

SC-7. GUARANTEES.- If within one year after operation of the equipment is begun, but not later than eighteen (18) months after the completion of delivery of all parts f.o.b. delivery point, any parts of the pumps, motors or appurtenances are found defective because of design, workmanship, or material, the supply contractor shall, at his own expense, furnish replacement parts of design, workmanship, and material approved by the contracting officer.

SC-8. FAILURE TO MEET GUARANTEES.- (a) Should any piece of equipment fail to meet the guarantees or other requirements of the contract within the time covered by the guarantee, the contracting officer may reject the equipment or may direct the contractor to proceed at once to make alterations or furnish new parts as may be necessary to meet the requirements. All expense of furnishing and

installing new parts or making alterations to existing parts, and of tests made necessary by failure of the apparatus to meet the guarantees and other requirements of the specifications, shall be borne by the contractor.

(b) If, after due notice, the contractor should refuse or persistently neglect to correct any defects, errors, omissions, or any other failure of the apparatus to meet the requirements of the specifications which might develop during the guarantee period, the Government may proceed at its own expense to correct such defects, errors, omissions, or failures and charge the contractor an amount equal to the actual expense so incurred.

SC-9. RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT.- The Government shall have the right to operate any and all apparatus as soon as, and as long as, it is in operating condition whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to permit operation of any apparatus which may be materially damaged by such operation before any required alterations or repairs have been made. All repairs or alterations required of the supply contractor shall be made by the supply contractor at such times as directed by the contracting officer. The repairs or alterations shall be made in such a manner and at such a time as will cause the minimum interruption in the use of the apparatus by the Government.

SC-10. SERVICE OF ERECTION ENGINEER.- (a) The installation of the equipment is not included in this contract and will be done by other agencies. The contractor shall furnish promptly upon written notice by the contracting officer, the services of a competent erection engineer to supervise and direct the erection and installation of this equipment. The services of the erection engineer will be paid for by the Government at an allowance of twenty-five dollars ($25.00) per calendar day from the time of departure from and to the time of return to his home station. Such allowance shall cover salary, travel, and living expenses of the erection engineer and any other costs occasioned by the furnishing of the service. No payment will be made for services of the erection engineer in connection with alterations to any of the equipment occasioned by failure of such equipment to comply with the requirements of the specifications.

(b) The erection and installation of the equipment by other agencies shall in no way relieve the contractor of sole responsibility for the equipment meeting all the requirements of these specifications and fulfilling all the contractor's guaranties.

(c) The contractor shall, upon completion of the installation of the equipment, submit a written statement to the contracting officer certifying that the equipment has been installed properly.

SC-11. FINAL EXAMINATION AND ACCEPTANCE.- When all the work specified under this contract has been completed and the equipment has successfully met the requirements of the field tests, the contracting officer will make a thorough examination of the equipment, and if it is found to comply with the requirements of the contract, it will be accepted and final payment will be made in accordance with the provisions of the contract.

SC-12. QUANTITIES.- Within the limits of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract prices.

Item No.	Quantity	Unit	Articles or Services
			Delivered f.o.b. railroad cars, Nashua, N.H. or f.o.b. truck at the Pumping Station located at the junction of Bridge and Hollis Sts., Nashua, N.H.
1	each	1	4500 g.p.m. sewage pump, with direct connected electric motor drive, intermediate shafting, suction and discharge piping, flap and gate valves, bolts and fittings
2	each	2	30-inch vertical propeller pump, with direct connected electric motor drive, flap valve, bolts and fittings

SC-13. PAYMENT.- The contractor will be paid as follows:

(a) Eighty percent (80%) of the unit contract price of the supplies contracted for, upon submission of properly certified invoices therefor, after delivery thereof;

(b) Twenty percent (20%) of the unit contract price on each unit delivered, after final tests and final acceptance thereof; but in any event payment will be made within six (6) months after such delivery, if not rejected within such time and if the units delivered comply with the specifications in all respects other than such as are determinable only by final tests.

PART IV. Technical Provisions

(TABLE OF CONTENTS)

SECTION 1. 30-INCH VERTICAL PROPELLER PUMPS

TP 1-01. SCOPE.- The contractor shall furnish, for installation by others, in the wet sump of the Pumping Station (to be constructed by others), two (2) thirty-inch (30") vertical open propeller pumps of the single stage submerged type designed especially to handle a dilute mixture of domestic sewage and storm water. Equipment to be furnished under these specifications shall include the pumps, direct connected electric motor drives, discharge piping, flap valves and appurtenances as specified herein. The dimensions of the pumps shall be as indicated on the drawings so that they can be installed by others in the space as indicated on the drawings after the Pumping Station superstructure is completed.

TP 1-02. SERVICE CONDITIONS.- The pumps will be placed into emergency flood control service and will be required to handle dilute mixtures of domestic sewage and storm water run-off during periods of high river stages. The pumps will be run dry for a fifteen (15) minute period about once each month. Each pump shall have a minimum discharge capacity of 25,000 g.p.m. against a total static lift of sixteen feet (16') and a minimum discharge capacity of 27,500 g.p.m. against a total static lift of six feet (6') under the hydraulic conditions indicated on the drawings. The discharge characteristics of the pumps shall be such that the electric motor drive will not be overloaded on a continuous basis at any condition of suction and discharge levels between the limits indicated on the drawing. The ranges of operating liquid levels at pump suction and discharge and pump setting elevations are indicated on the drawings. The characteristics of the pumps shall be such that the specific speed of the pumps shall not exceed the upper limit of specific speeds as indicated on the current published curves of the Hydraulic Institute at any operating head condition within the range indicated on the drawings.

TP 1-03. MATERIALS.- The component parts of the pumps shall be cast or fabricated of the materials specified below, or if not specifically specified, shall be manufactured of materials which have proven satisfactory in similar installations and which are approved by the contracting officer. Castings shall be seasoned or annealed to relieve shrinkage stresses before final machining.

Pump Part	Material Specification
1. Discharge Column and Elbow.	Federal Specification QQ-I-686a, Grade A or B, Iron, Wrought (Refined); Bars, or Federal Specification QQ-I-652, Class 20,

Pump Part (Con'd)	Material Specification
	Iron, Gray; Castings or of Corrosion Resistant Steel Alloy having corrosion qualities equal to that possessed by steel of the following analysis:
	Carbon Maximum 0.10% Manganese 0.10% to 0.30% Phosphorus 0.10% to 0.20% Sulphur Maximum 0.05% Silicon 0.50% to 1.00% Copper 0.30% to 0.50% Chromium 0.50% to 1.50% Yield Point not less than 50,000 lbs. per sq. in.
2. Suction Bell.	Federal Specification QQ-I-652, Class 20, Iron; Gray; Castings.
3. Impeller Housing.	Federal Specification QQ-I-652, Class 30, Iron; Gray; Castings.
4. Impeller.	Federal Specification QQ-B-691b, Composition 5, Bronze; Castings.
5. Driveshaft.	Federal Specification QQ-S-763a, Class 7, Steel, Corrosion-Resisting; Bars and Forgings (except for Reforging) or Federal Specification QQ-N-281, Class A, Nickel-Copper-Alloy; Forgings, Plates, Rods, Shapes, Sheets, Strips and Wire.
6. Driveshaft Tube.	Wrought Iron or Corrosion Resisting Steel as specified for Item 1 above.
7. Discharge Piping.	Materials specified for Discharge Column and Elbow.

TP 1-04. DISCHARGE COLUMN AND ELBOW.- The discharge column and elbow shall be fabricated of three eighths (3/8) inch or heavier plate of two piece all welded construction or two piece cast iron construction to correspond to American Water Works Association Class B cast iron pipe standards and shall include a heavy flange mounting plate for supporting the pump and motor unit on the motor support plate which will be furnished by others, an intermediate companion flange, a bottom flange for attachment to the pump impeller housing and the discharge flange

at the State Street Bridge

for attachment of the discharge piping. The upper side of the mounting plate and the underside of the bottom flange shall be machined to form a close fitting male and female joint with the motor adapter ring and the pump impeller housing respectively. The discharge elbow shall be formed to a long radius to provide a smooth and hydraulically efficient water conduit. The discharge flange and the intermediate companion flanges shall be faced and drilled to conform with the dimensions of a thirty-inch (30") pipe size flange of the 125 pound American Cast Iron Flanged Fitting Standard (B16a-1928). Flanged connections shall be bolted together with hot pressed square head bolts with hexagonal nuts, both conforming with American Standard ASA B 18.2 dimensions and fabricated of steel conforming to ASTM Specification A 107 open hearth screw steel grade.

TP 1-05. SUCTION BELL.- The suction bell shall be a close grained grey iron casting with wide flared bell, with integrally cast struts to support the lower pump propeller bearing and to reduce vortex. The interior of the bell shall be formed to a smooth efficient hydraulic passage. The upper end of the bell shall have a cast flange machined to form a male and female joint with the pump propeller housing. The bell shall be provided with lifting lugs to facilitate handling.

TP 1-06. IMPELLER HOUSING.- The impeller housing shall be a close grained grey iron casting with smooth efficient hydraulic passages and integrally cast diffusion vanes which in addition to their hydraulic function shall support the upper impeller bearing housing. The lower end of the impeller bearing housing shall be counterbored to receive an effective bottom bearing seal. The flanged ends of the impeller housing shall be machined to form close fitting male and female joints with the suction bell and the discharge column.

TP 1-07. IMPELLER.- The impeller shall be cast bronze with smooth finish for efficient hydraulic action. The impeller shall be hydraulically and mechanically balanced for smooth vibrationless operation. The impeller shall be effectively attached to the driveshaft to prevent axial or torsional movement during normal rotation or upon reversal of rotation.

TP 1-08. DRIVESHAFT.- The sectional drive shaft shall be fabricated of corrosion resisting alloy steel shafting of sufficient diameter to insure an installation free of torsional vibration. The shaft sections shall be joined with detachable couplings designed to transmit torque in the direction of impeller rotation. The upper end of the shaft shall be designed to project through the hollow shaft of the motor and shall be machined and fitted for adaptation to the safety coupling which is part of the motor and shall be fitted with an adjustable thrust nut. The thrust nut shall be designed to permit positioning the pump impeller in the propeller housing and to transmit the hydraulic and weight thrust loads to the motor thrust bearing.

TP 1-09. DRIVESHAFT BEARINGS.- The driveshaft shall be fitted with closely spaced phosphor bronze bearings to prevent shaft whip. The upper and lower propeller bearings shall be protected by labyrinth or flexible seals designed to prevent the entrance into the bearings of sand carried by the storm water. The driveshaft bearings shall be supported in proper and rigid alignment and enclosed by a sectional corrosion resisting steel or wrought iron tube which in turn shall be supported by an adjustable nut bearing on the pump mounting plate.

TP 1-10. LUBRICATION SYSTEM.- Each pump shall be equipped with a centralized lubrication system of either the oil or grease type. Oil lubricators shall be of the forced feed automatic type designed to dispense oil only during pump operation and shall be similar and equal to Madison-Kipp Model No. 50 as manufactured by Madison-Kipp Corp. of Madison, Wisconsin. A means of adjusting the driving belt to take up slack shall be provided. If the oil type system is furnished, the lower impeller bearing shall be equipped with a grease fitting with pipe or tubing so that greasing may be done from the motor floor. Grease lubricators shall be of the manual pump type similar and equal to "Farval Dualine." The lubricator shall be equipped with a pressure gauge and a distribution manifold with individually adjustable valves. Lubrication distribution lines shall be of genuine wrought iron pipe with malleable iron fittings or heavy copper tubing with brass fittings. Lubrication lines shall be neatly installed and firmly attached to shaft tube or the discharge column.

TP 1-11. MOTOR SUPPORT ADAPTER RING.- A welded steel or cast iron adapter ring shall be provided for adapting the motor flange to the pump mounting plate. The adapter ring shall be machined top and bottom for a closely fitting male and female joint with the pump mounting plate and the motor flange.

TP 1-12. DISCHARGE PIPING.- The discharge piping shall form the spool-piece connection between the pump discharge flange and the flap valves and in its center shall have a continuously welded or integrally cast ring for mounting in the concrete wall. The end flanges shall be faced and drilled to conform with the dimensions of a thirty inch (30") pipe size flange of the 125 pound American Cast Iron Flanged Fitting Standard (B16a-1928). The discharge piping shall be all welded construction of three-eighths inch (3/8") or heavier plate or cast iron construction with its inner diameter matching the inner diameter of the pump discharge and the flap valve. Flanges and rings shall be cut from solid plate of thickness conforming to flange standards or shall be cast integral with the pipe. The outer diameter of welded flanges shall be machined. The outer diameter of the intermediate ring may be left rough.

TP 1-13. DISCHARGE ELBOW FLANGED JOINT.- The flanged joint between the discharge elbow and the wall thimble shall be made so that there will be no metal to metal contact between the flanges or between the bolts, bolt heads or nuts and the flanges. The flanges shall be separated by a neoprene ring gasket of one-half inch (1/2") nominal thickness with inside diameter equal to the inside diameter of the pipe and an outside diameter of thirty-six inches (36"). The neoprene ring gasket shall be compressed between the flanges to ninety-five percent (95%) its natural thickness. The bolts shall be sheathed with close fitting neoprene tubes of three-sixteenths inch (3/16") minimum wall thickness for their installed lengths between the outer edges of the pipe flanges. The bolt heads and nuts shall be separated from the backs of the flanges by one-quarter inch (1/4") thick neoprene and steel plate washers of three inch (3") outside diameter. The inside diameter of the neoprene washer shall fit closely on the body of the bolt and the neoprene shall be installed in contact with the pipe flanges. Neoprene gaskets, washers and tubing shall be of forty (40) durometer hardness with an allowable tolerance of plus or minus ten percent (10%).

TP 1-14. FLAP VALVES.- The outer end of the pump discharge piping shall be fitted with a thirty inch (30") flap valve conforming in general design features and dimensions to the circular automatic flood gates as manufactured by the Coldwell-Wilcox Division of the Krajewski-Pesant Mfg. Corp. of New York City and as shown on Plate No. C-4, Section C of that company's catalogue. The body and the flap shall be close grained cast iron with machined flange and seat facings. The flange dimension shall conform to the thirty inch (30") pipe size flange of the 125 pound American Cast Iron Flanged Fitting Standard (B16a-1928). The body and flap shall be fitted with removable machined bronze facings. The double hinge pins on each hinge, the hinge adjusting pin, adjusting screws and nuts and bushings shall be fabricated of bronze. The hinge pins and hinge adjusting pins may be fabricated of ocrrosion resisting steel. The maximum horizontal dimension from the face of the mounting flange to the face of the bronze seat on the body, measured on the center of the thirty inch (30") diameter, which will be permitted in seven inches (7") so as to cause a minimum restriction in the hydraulic passages of the discharge chamber.

TP 1-15. PAINTING.- (a) General.- All exterior and interior surfaces of all ferrous metals used in the pump and piping assemblies except mating machined surfaces, the driveshafts, the interior of the shaft tubes and the portions of the discharge piping which will be embedded in the concrete shall be given protective coatings of black coal tar base paint.

(b) Material.- Paint shall be an acid and alkaline resistant coal tar pitch base paint having the chemical and physical properties of "Everjet Paint" as manufactured by the Barrett Division of Allied Chemical and Dye Corporation. Hot bituminous protective coatings standard with the manufacturer furnishing the pumps may be used in lieu of the paint specified when approved by the contracting officer.

(c) Preparation of Surface to be Painted.- All interior and exterior surfaces to be painted shall be thoroughly cleaned of mill scale, rust and foreign material of all kinds. Grease and oil shall be removed with liquid volatile solvents. The first coat of protective paint shall be applied while the metal surfaces are clean and dry.

(d) Application.- Paint shall be applied in strict conformance with the manufacturer's printed directions under conditions which will insure good drying. Surfaces which will be accessible in the field shall be given two (2) shop coats. Surfaces which will not be accessible in the field shall be given three (3) shop coats.

(e) Protection of Surfaces Not Painted.- Shafts and contacting finished surfaces shall not be painted but shall be protected with a coat of "Nox Rust" No. 99A or other approved slushing compound.

TP 1-16. STANDARD TEST.- All standard tests required for materials specified herein will be waived; in lieu thereof, the contractor shall furnish an itemized list of all the important materials stating therein the part name, the standard specification with which the material complies, the manufacturer's name and the manufacturer's trade name for the material.

TP 1-17. GUARANTEE.- The following equipment to be furnished under this section of the specifications shall be guaranteed for a period of one (1) year from the date of final acceptance thereof against defective materials, design, and workmanship: Thirty inch (30") Vertical Propeller Pump; Suction Bell; Flap Valves and Electric Motor. Upon receipt of notice from the Government of failure of any part of the guaranteed period, the affected part of parts shall be replaced promptly with new parts at the expense of the contractor.

TP 1-18. SHOP TEST.- (a) General.- The pump shall be subjected to and shall successfully pass, in the shops of the manufacturer, hydrostatic pressure tests. Actual running tests under assimilated operating conditions shall be made to determine pump characteristics and conformance with the requirements of the specifications. All shop tests shall be subject to witness by the contracting officer or his authorized

representative. The contractor shall give notice in writing at least two (2) weeks prior to the date on which the pumping unit will be ready for test. The contracting officer or his duly authorized representative will, in writing, notify the contractor that he will witness the test within the prescribed time or waive the requirement of the presence of the Government inspector in lieu of sworn statements, submitted in triplicate, of the tests made.

(b) Tests.- The hydrostatic test pressure shall be not less than fifty (50) pounds per square inch. The running tests shall be made with the unit driven by the motor to be furnished with the pump or if this is not practicable by manufacturer's test motor.

(c) The tests shall be conducted in accordance with the test code of the Hydraulic Institute and shall show before acceptance of the units that the pump has general characteristics of head, capacity and efficiency as shown by the characteristic curve submitted by the contractor. A certified copy of the test log sheet and test curves shall be furnished the contracting officer.

TP 1-19. FIELD TESTS.- After installation by the erection contractor the pump will be operated and tested in the presence of the erection engineer provided by the supplier of the pumps for a sufficient period of time to demonstrate that the equipment is in satisfactory operating condition and that it meets the requirements of these specifications. The tests will be made to demonstrate proper balance and mechanical performance and will be made at whatever pumping heads are available and with sewage which may be backed up into the inlet chamber as is necessary to submerge the pump impeller. Any alterations necessary to bring the pump, motor, inlet and discharge piping or valves up to the requirements of the specifications shall be made by and at the expense of the supply contractor.

TP 1-20. ACCESSORIES.- The contractor shall furnish special wrenches and tools which are required for ordinary maintenance operations. The tools shall be furnished in a strong canvas roll with separate pockets for each tool. The contractor shall furnish six (6) copies of repair parts lists containing pictorial cuts or drawings with part numbers labeled thereon and six (6) copies of manufacturer's pamphlets, catalogues and bulletins describing operation, maintenance and lubrication of the equipment. The lists and bulletins will be incorporated into a permanent manual of operations for the pumping station which will later be prepared by the contracting officer. The pages of the manual will be the size of the pages of these specifications.

TP 1-21. APPROVAL.- The following items specified in this section shall be submitted for approval of the contracting

officer and such approval shall be obtained in writing prior to the use of these items in this work.

(a) Shop bill of essential materials comprising the complete assembly of the pump and parts attached thereto.

(b) Name of paint manufacturer, identification number, certificate of ingredients and color samples.

(c) Shop drawings of pump showing name of manufacturer, catalogue number, size, details of construction, method of mounting and erecting and all other pertinent data.

TP 1-22. PAYMENT.- Payment for furnishing each of the two (2) thirty inch (30") vertical propeller type pumps will be made at the contract unit price for "Furnishing 30-inch Propeller Pump," which price shall constitute full compensation for furnishing all plant, labor, equipment and material and performing all work required to furnish in acceptable order, each pump, electric motor drive, intermediate shafting and couplings, suction bell, discharge piping, flap valve, bolts, nuts and washers, painting and other features indicated on the drawings and required for complete equipment ready for installation by others.

SECTION 2. SEWAGE PUMP

TP 2-01. SCOPE.- The contractor shall furnish, for installation by others, in the dry sump of the Pumping Station (to be constructed by others) one (1) vertical open shaft centrifugal pump designed especially to handle raw sewage and trash. Equipment to be furnished under these specifications includes the pump, electric motor drive, intermediate shafting and couplings, suction bell, intake and discharge piping, gate valves, flap valve and anchor bolts. The pump will be installed by others as indicated on the drawings and shall be of such physical size as to permit installation in the pumping station after the pumping station is completed.

TP 2-02. SERVICE CONDITION.- The pump will be placed into emergency flood control service and will be required to handle raw domestic sewage or sewage and storm water mixtures during periods of high river stages. The pump will be run dry for a 15-minute period once each month. The pump shall have a minimum discharge capacity of 4500 g.p.m. against a total static lift of sixteen (16) feet under the hydraulic conditions as indicated on the drawings. The pump discharge characteristics shall be such that the electric motor will not be overloaded on a continuous basis at any condition of suction and discharge levels between the limits indicated on the drawing. The ranges of operating liquid levels at pump suction and discharge and pump elevations are indicated on the drawings. The operating speed of the pump at rated capacity shall not exceed 575 r.p.m., and the specific speed of the pump at the point of maximum efficiency shall not exceed 4000 r.p.m.

TP 2-03. MATERIALS.- The component parts of the pump shall be cast or fabricated of the materials specified below, or if not specifically specified, shall be manufactured of materials which have proven satisfactory in similar installations and which are approved by the contracting officer. Castings shall be seasoned or annealed to relieve shrinkage stresses before final machining.

Pump Part	Material Specification
1. Casing	Federal Specification QQ-I-652 Class 30, Iron, Gray; Castings
2. Removable Head	Federal Specification QQ-I-652 Class 30, Iron, Gray; Castings
3. Pedestal Base	Federal Specification QQ-I-652 Class 20, Iron, Gray; Castings
4. Impeller	Federal Specification QQ-B-691b, Composition 5, Bronze Castings
5. Pump Shaft	Federal Specification QQ-S-763a, Class 7, Steel, Corrosion-Resisting; Bars and Forgings (Except for Reforging); or Federal Specification

Pump Part	Material Specification
5. (Cont'd.)	QQ-N-281; Class A, Nickel Copper-Alloy; forgings, Plates, Rods, Shapes, Sheets, Strips, and wire.
6. Intermediate Shaft	Federal Specification QQ-S-671, FS No. 1045, Steel; Carbon and Alloy, Bars, Cold Rolled and Stress Relief Annealed or Seamless Drawn Carbon Steel tubing.
7. Inlet and Discharge Piping	Federal Specification WW-P-441a, Class B-Extra Strong, Black, Pipe; Wrought Iron, Welded, Black and Zinc Coated or 125 lb. Class, Flanged Cast Iron Pipe.

TP 2-04. CASING.- (a) Type and Strength. The pump impeller casing shall be of the volute type with smooth interior, made of high-grade cast iron of ample strength to withstand safely all stresses that will be imposed during erection and operation.

(b) Removable Head. - The casing shall be provided with a removable top head of cast iron that will permit the removal of the impeller from the top of the pump without disturbing the suction or discharge connections. The head may be made solid or in halves and bolted together. The head shall be machined for a close fitting male and female joint with the impeller's lower casing, so as to secure proper alignment. The casing shall be constructed without stationary guide vanes or diffusion vanes.

(c) Hand Holes. - Hand holes shall be provided in the casing and suction nozzle to provide access to both suction and discharge sides of the impeller. The interior surfaces of the covers shall be shaped to continue the contour of the interior of the water passages.

(d) Drain. - The casing shall be provided with tapped holes for the drain. The high point of the casing shall be fitted with a tapped plugged hole for a vent pipe connection if this is later desired.

TP 2-05. SUCTION AND DISCHARGE CONNECTIONS. (a) Suction Nozzle. - The suction nozzle elbow shall be incorporated in a special pedestal base gray iron casting or shall be a long radius elbow housed within a pedestal base casting.

(b) Suction and Discharge. - Suction and discharge connections shall be flanged 125-Pound American Cast Iron Flanged Fittings Standard B16a-1928.

TP 2-06. IMPELLER. The impeller shall be of the enclosed non-clogging single suction type cast in one piece of bronze. The impeller shall be finished all over to a smooth surface and shall be hydraulically and mechanically balanced. The impeller shall be securely locked to the shaft in such a manner as to prevent damage in case the direction of rotation should become reversed. The impeller shall have openings of a sufficient size to pass spheres six (6) inches minimum in diameter.

TP 2-07. PUMP SHAFT. The pump shaft shall be of high-grade, open hearth steel, heat treated and accurately machined to finished dimensions. It shall be of ample size to transmit the loads without whip, vibration, or undue deflection at all speeds from zero to maximum. The first critical speed of the pump rotor, consisting of the shaft, impeller, and couplings, shall be not less than 150 per cent of the normal running speed. The portion of the shaft within the stuffing box shall be protected by a removable bronze sleeve. The sleeve shall be securely fastened to the shaft so that either forward or reverse rotation of the pump will not cause it to loosen. The sleeves shall be properly machined and ground to finished dimensions.

TP 2-08. STUFFING BOX AND GLAND. Leakage along the pump shaft shall be prevented by means of an approved stuffing box and gland, designed to take sufficient packing to insure tight joints without undue pressure on the shaft. The stuffing box shall be provided with a bronze water seal ring to furnish lubrication and sealing with grease. The packing gland shall be of the split type to allow removal without disturbing any other part of the pump. The gland bolts shall be made of bronze with bronze nuts.

TP 2-09. BEARINGS. The pump bearings shall be two in number and shall be of the anti-friction, grease lubricated type. The bearings shall be of ample capacity to carry the load. Bearings shall be a combined radial and thrust bearing and shall be capable of carrying, without undue stress, the maximum unbalanced hydraulic thrust of the pump. The bearings shall be mounted in the casing head and shall be readily removable. The bearings shall be designed to operate under all conditions of operation that may be expected. A centralized lubrication system shall be provided, neatly mounted on the motor base. The lubrication system shall be similar and equal to "Farval Dualine" with details as specified in paragraph TP 2-10, "LUBRICATION SYSTEM" of the specifications.

TP 2-10. INTERMEDIATE SHAFT. The intermediate shaft for connecting the motor shaft to the pump shaft shall be made in one or two sections. The intermediate shafts shall be attached

to the pump shaft and the motor shaft and to each other with approved type all-metal flexible couplings or universal joints. Couplings or universal joints shall be fitted with grease gun fittings. The intermediate shaft shall be tubular or solid steel design of sufficient rigidity and balanced so as to minimize vibration. If two intermediate shafts are furnished, a self-aligning intermediate steady bearing and suitable support beam shall be furnished complete with fittings and bolts for attachment to the concrete.

TP-2-11. FLAP VALVE. The flap valve shall be flange frame Coldwell-Wilcox (Plate No. C-1), or equal, of required size with bronze rings in both frame and flap and with bronze hinge pins. The body and flap shall be suitable for at least 35 pounds per square inch working pressure. Flanges shall be 125 pound American Standard, diameter faced and drilled according to the 1928 American Standard for Standard Flanged Fittings.

TP 2-12. GATE VALVE. The suction and discharge lines shall each be provided with a flanged, iron body, solid wedge, rising stem gate valve designed for 50 pounds per square inch working pressure. The wedge and seats shall be bronze faced. The valves shall be similar and equal to List 35X, Figure 156, as manufactured by The Chapman Valve Manufacturing Company of Indian Orchard, Mass.

TP 2-13. INLET AND DISCHARGE PIPING. The inlet and discharge piping shall be wrought iron or cast iron. Pipe flanges for wrought iron pipe shall be 125-pound cast iron. All flanges shall be faced and drilled in accordance with 1928 American Standard for Standard Flanged Fittings with two bolt holes straddling the vertical axis. The flanged connections shall be bolted together with hot pressed bolts having a square head and hexagon nuts, both conforming with American Standard ASA B 18.2 dimensions and fabricated of steel conforming to ASTM Specification A 107, open hearth screw steel grade. Gaskets shall be full surface neoprene one-eighth (1/8) inch thick.

TP 2-14. ACCESSORIES. The contractor shall furnish a grease gun for flexible coupling lubrication and special wrenches and tools which are required for ordinary maintenance operations such as adjustment to the stuffing box gland. The tools shall be furnished in a strong canvas roll with separate pockets for each tool. The contractor shall furnish six (6) copies of repair parts lists containing pictorial cuts or drawings with part numbers labeled thereon and six (6) copies of bulletins describing operation, maintenance and lubrication of the equipment. The list and bulletins will be incorporated into a permanent manual of operations for the Pumping Station which will later be prepared

by the contracting officer; the pages of the manual will be the size of the pages of these specifications.

TP 2-15. STANDARD TEST.- The standard test requirements shall be as specified in paragraph TP 1-16.

TP 2-16. GUARANTEE. The following equipment to be furnished under this section of the specifications shall be guaranteed for a period of one year from the date of final acceptance thereof against defective materials, design and workmanship; Vertical Shaft Centrifugal Sewage Pump; Flap Valve, Gate Valves and Electric Motor and appurtenances. Upon receipt of notice from the Government of failure of any part of the guaranteed period, the affected part or parts shall be replaced promptly with new parts at the expense of the contractor.

TP 2-17. SHOP AND FIELD TEST.- The shop and field tests for the pump shall conform to the requirements of paragraphs TP 1-18 and TP 1-19.

TP 2-18. PAINTING. (a) General.- All exterior and interior surfaces of all ferrous metals used in the pump and piping assemblies, except mating machined surfaces, the drive shaft and the portions of the suction and discharge piping which will be embedded in the concrete, shall be given protective coatings of black coal tar base paint.

(b) Material.- Paint shall be an acid- and alkaline-resistant coal-tar pitch base paint, having the chemical and physical properties of "Everjet Paint," as manufactured by the Barrett Division of Allied Chemical and Dye Corporation. Hot bituminous protective coatings standard with the manufacturer furnishing the pump may be used for painting the pumps when approved by the contracting officer.

(c) Preparation of Surface to be Painted.- All interior and exterior surfaces to be painted shall be thoroughly cleaned of mill scale, rust and foreign material of all kinds; grease and oil shall be removed with volatile liquid solvents. The first coat of protective paint shall be applied while the metal surfaces are clean and dry.

(d) Application.- Paint shall be applied in strict conformance with manufacturer's printed directions and under conditions which will insure good drying. Surfaces which will be accessible in the field shall be given two (2) shop coats and a final field coat. Surfaces which will not be accessible in the field shall be given three (3) shop coats.

(c) Protection of Surfaces Not Painted. - Shafts and finished surfaces finished for working contact shall not be painted but shall be protected with a coat of "Nox Rust" No. 99A or other approved slushing compound.

TP 2-19. APPROVAL. The following items specified in this section shall be submitted for approval of the Contracting Officer and such approval shall be obtained in writing prior to the use of these items in this work.

(a) Shop bill of essential materials comprising the complete assembly of the pump and parts attached thereto.

(b) Name of paint manufacturer, identification number, certificate of ingredients and color samples.

(c) Shop drawings of pump, showing name of manufacturer, catalogue number, size, details of construction method of mounting and installing and all pertinent data.

TP 2-20. PAYMENT. Payment for furnishing the sewage pump will be made at the contract lump sum price for "Furnishing Sewage Pump" which price shall constitute full compensation for furnishing all plant, labor and materials and performing all work required to furnish, in acceptable order, the pump, electric motor drive, intermediate shafting and couplings, suction bell, intake and discharge piping, gate valves, flap valve, bolts, nuts and washers, anchor bolts, painting and other features indicated on the drawings and required to provide complete equipment ready for installation by others.

SECTION 3. PUMP MOTORS

TP 3-01. SCOPE. - The work covered by this section includes the furnishing of electric motors for the pumps furnished under this contract.

TP 3-02. TYPE. - The motors shall be of the vertical drip-proof squirrel cage type and shall be direct connected to the pumps. The motors shall be furnished with ring bases for mounting on the propeller pump adapter ring and with a "B flange" base for mounting on the sewage pump motor support. The sewage pump motor support will be provided by others under a separate contract.

TP 3-03. CHARACTERISTICS. - (a) Starting. - The motors shall be suitable for full voltage starting and shall have starting torques not less than rated full load torque. The starting torque shall be sufficient to start the pumps under the maximum conditions specified. Locked rotor current at full voltage shall not exceed 600% of full load current.

(b) Running. - The motors shall be of sufficient capacity to drive the pumps under the conditions specified and shall have a break-down torque of not less than 200% of rated full load torque.

TP 3-04. RATING. - The motors shall be rated 440 volts, 3 phase, 60 cycles. The temperature rises, under continuous rated full load conditions, shall not exceed those established by A.S.A. Standards for 40° C machines. The motors shall be capable of carrying continuously 1.15 times their rated load without exceeding safe operating temperatures, when operated at their rated voltage and frequency and in an ambient temperature not exceeding 40° C. This additional 15% service factor shall be marked on the name plate in addition to the normal rating. Where the rated full load horsepower of a motor is less than that required to drive the pump under maximum load conditions, any part of the 15% additional load capacity of the motor may be utilized.

TP 3-05. POWER FACTOR AND EFFICIENCY. - The power factor and efficiency at rated load, speed, voltage and frequency shall not be less than the following:

	Propeller Pump Motors	Sewage Pump Motor
Power Factor	83	73
Efficiency	90	86

TP 3-06. FRAMES. - The stator frames shall be of high grade cast iron, cast steel, or welded steel construction. They shall be of ample strength and rigidity and shall present a neat, modern appearance.

TP 3-07. STATOR CORES. - Stator cores shall consist of laminations of high grade non-aging, annealed, electrical silicon steel. In order to reduce eddy current losses to a minimum, the laminations shall be insulated with baked-on enamel or with other equally effective insulation. The laminations shall be of the single circular type or the segmental type and shall be held firmly together by means of compression between end rings. During assembly the laminations shall be carefully inspected to see that only clean-cut punchings and those free from burrs are used. After assembly, the laminations shall be given a treatment of two coats of black Gilsonite or Bakelite spar varnish, on the teeth of the inner bore and outer periphery. The surface of the rotor shall be similarly treated.

TP 3-08. STATOR WINDINGS AND INSULATION. - (a) All motors shall have special moisture-proof insulation of a type designed and constructed to withstand severe humidity conditions and, so far as practicable, to operate after long periods of idleness without previous drying out.

(b) Submission of Process for Approval. - A detailed description of the manufacturing process and of the materials used in insulating the stator windings shall be submitted to the contracting officer for approval before manufacture of the motors is commenced. If, in the opinion of the contracting officer, the insulation described is not of the highest quality and if the methods of manufacture are not considered to be in accordance with best modern practice, the motors will not be accepted.

(c) Minimum Requirements. - The following specifications describe the minimum requirements for acceptable insulation and are not intended to restrict or prohibit the use of materials or methods which may give equal or better performance under the service conditions described above.

(1) Open-slot construction with form-wound coils shall be used wherever practicable. The sewage pump motor may have over-hung slots with random wound coils.

a. Random-wound coils shall be wound with enameled wire, single cotton or paper covered. After winding, the completely wound stator winding shall be given not less

than 6 dips in insulating varnish, and shall be baked after each dip in an oven with regulated temperature control. The completed winding shall be given a high frequency turn-to-turn insulation test at not less than 2500 volts applied across each phase.

b. Form-wound coils shall be wound with rectangular wire having adequate covering for turn-to-turn insulation, consisting of cotton, paper, cellulose acetate or a combination of these. The formed coil shall be given not less than 4 dips in insulating varnish and baked after each dip in an oven with regulated temperature control, or it shall be vacuum impregnated with asphaltic compound.

c. The insulation to ground shall be processed on the coil; slot tubes or cells will not be acceptable. The insulation shall be of adequate thickness and breakdown strength throughout the length of the coil. Mica shall be used in the slot portion and shall be of adequate thickness to withstand the dielectric tests specified under Factory Tests.

d. Before the coils are placed in the slots each coil shall be given a high frequency turn-to-turn insulation test at not less than line voltage, the minimum to be 2500 volts.

(2) Form-wound coils shall be of such uniformity that the stator windings of all similarly rated motors will be alike in shape and size and interchangeable. The coils shall be held in place by wedges of micarta or equal material. After the winding has been completed the stators shall be given not less than 4 coats of insulating varnish and baked after each coat, or shall be given vacuum impregnation treatment followed by not less than 2 varnish and baking treatments.

TP 3-09. SHAFT. - The rotor shaft shall be made of high grade steel, finished all over and of ample size to drive the pump. It shall be of the hollow type for the propeller pump motors and of solid type for the sewage pump motor. The hollow shaft shall be equipped with a coupling designed to automatically disengage the motor shaft from the pump shaft should the direction of rotation be reversed.

TP 3-10. BEARINGS. - All thrust bearings shall be of the antifriction type and shall be of sufficient capacity for all loads imposed upon them including pump thrust loads in the case of the hollow shaft motors. All motors shall

given in water temperatures no greater than [illegible]

(d) Complete tests only will be witnessed by a representative of the contracting officer. The contracting officer or his duly authorized representative will, in writing, notify the contractor that he will witness the test within the prescribed time or waive the requirement of the presence of the Government inspector in lieu of sworn statements, furnished in triplicate, of the tests made.

(e) Certified results of all tests in typewritten form shall be furnished in triplicate to the contracting officer.

(f) Performance curves shall be furnished in triplicate to the contracting officer. These curves shall be plotted from the results of the complete tests performed on one motor of each rating. Performance curves shall indicate the speed, horsepower, power factor, efficiency and current, plotted against torque as abscissa.

(g) Insulation Resistance. - Temperature test results shall be plotted on semi-logarithmic graphs, the insulation resistance valves as logarithmic or ordinates and the temperature valves as uniform abscissa.

A separate set of curves shall be furnished for each motor given the complete tests.

TP 3-14. PAINTING. - All exposed surfaces of the motors shall be enameled with two coats of machinery enamel and one enamel undercoat, applied as recommended by the manufacturer of the enamel. The enamel and undercoat shall be similar and equal to the Lavax Machinery Enamel and undercoat manufactured by the Pittsburg Plate Glass Co. Finish shall be a green matching the Vista Green, Color No. UC-10076, made by that company.

TP 3-15. APPROVAL. - The following items specified in this section shall be submitted for approval of the contracting officer and such approval shall be obtained in writing prior to the use of these items in this work.

(a) Outline Drawings.

(b) Specifications of proposed insulation processes.

(c) Guaranteed power factors and efficiencies at ratio voltage, frequency at 100%, 75% and 50% of ratio load.

TP 3-16. PAYMENT. - Separate payment will not be made for furnishing motors; all costs therefor shall be included in the contract prices for the pumps.

Bid No.
Serial No. 19-023-46-102

B I D
(REVISED)
(SUPPLY CONTRACT)

Date: July 22, 46
(To be inserted by bidder)

To: The District Engineer
U. S. Engineer Office
3d Floor, Park Square Bldg.
31 St. James Ave.
Boston 16, Massachusetts

In compliance with your Invitation for bids dated 25 June 1946 the undersigned hereby proposes to furnish the materials and supplies listed on the reverse hereof or on the accompanying schedule within the time specified and at the prices stated opposite the respective items, and agrees upon receipt of written notice of the acceptance of this bid or any items thereof within 60 days after the date of opening of the bids, to execute W. D. Contract Form No. 1 in accordance with the bid as accepted.

The undersigned further agrees to give bond, if required, with good and sufficient surety or sureties, for the faithful performance of the contract, within 10 days after the prescribed forms are presented for signature. If required by the invitation, security (bid bond - U. S. Standard Form No. 24) is inclosed.

Discount will be allowed for prompt payment as follows: 10 calendar days 2 percent; 20 calendar days ___ percent; 30 calendar days ___ percent; or as stated in the schedules.

Discount time will be computed from date of the delivery of the supplies to carrier when final inspection and acceptance are at point of origin, or from date of delivery at destination or port of embarkation when final inspection and acceptance are at those points, or from date correct bill or voucher properly certified by the contractor is received if the latter date is later than the date of delivery.

Note: If the bidder is a corporation indicate state of incorporation under signature, and if a partnership, give full names of all partners.

Aetna Engineering Company.
By Buster Robertson.
Sales Mgr.
(Title)
80 Boylston St. Boston, Mass.
(Business Address)

(IF A CORPORATION, AFFIX CORPORATE SEAL)

Engineer Form No. 1449
Approved 20 Aug. 1945

Inv. No. 19-023-46-102

SCHEDULE

ITEM NO.	ARTICLES OR SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLLARS	AMOUNT CENTS
	Delivered f.o.b. railroad cars, Nashua, N.H. ~~or f.o.b. truck at the Pumping Station located at the junction of Bridge and Hollis Sts.,~~ Nashua, N. H.					
1	4500 g.p.m. sewage pump, with direct connected electric motor drive, intermediate shafting, suction and discharge piping, flap and gate valves, bolts and fittings	1	each		$4996	00
2	30-inch vertical propeller pump, with direct connected electric motor drive, flap valve, bolts and fittings	2	each		$17993	00
	TOTAL, ITEMS 1 AND 2				$22989	00

Bidder will indicate in which category he belongs:

Manufacturer of, or Regular Dealer in, the materials offered,

Manufacturer ☐

Regular Dealer ☒

Manufacturer's plant situated in what city:

Item No. 1 - HAMILTON, OHIO

Item No. 2 - SAN FRANCISCO, CALIF.

Bidder's Name AETNA ENGINEERING CO.

The overall costs of destination can be placed [illegible]

Inv. No. 19-023-46-102

DATA SHEET

30-Inch Pumps

Manufacturer's Name	Fairbanks Morse & Company
Guaranteed capacity at 6 ft. total static lift under the hydraulic conditions indicated on the drawings	28550 G.P.M. - O.K. [illegible]
Guaranteed capacity at 16 ft. total static lift under the hydraulic conditions indicated on the drawings	25500 G.P.M. - O.K. [illegible]
Maximum HP required for any head within the operating range indicated on the drawings	144 H.P. O.K. [illegible]
Speed in RPM	700 R.P.M. - O.K. [illegible]
Shut-off head	91'
Diameter of main drive shaft in inches	2 3/16"
Weight of complete pump assembly in pounds (exclusive of motor and discharge piping)	80001bs.

Sewer Pump

Manufacturer's Name	Economy Pumps Inc.
Guaranteed capacity at 6 ft. total static lift under the hydraulic conditions indicated on the drawings	5750 G.P.M. Plus.
Guaranteed capacity at 16 ft. total static lift under the hydraulic conditions indicated on the drawings	4500 G.P.M.

Bidder's Name Hetha Engineering Co.

Inv. No. 19-023-46-102

DATA SHEET

Sewer Pump (Contd.)

Maximum HP required for any head within the operating range indicated on the drawings	29
Speed in RPM	575
Shut-off head	34'
Diameter of main drive shaft in inches	2 3/16"
Weight of complete pump assembly in pounds (exclusive of motor, intermediate shafting and piping)	2700 lbs.

Electric Motor Drives - 30-inch Pump

Manufacturer's Name	Gen. Elect. Co.
Type of Motor	VERTICAL H.S.
N.E.M.A. rating	150 H.P.

Electric Motor Drive - Sewer Pump

Manufacturer's Name	Gen Elect. Co.
Type of Motor	VERTICAL - S-S.
N.E.M.A. rating	30 H.P.

Gate Valves

Manufacturer's Name	CHAPMAN VALVE Co
Manufacturer's catalogue model designation	Fig 156

Flap Valves

Manufacturer's Name	COLDWELL-WILCOX DIVISION
Manufacturer's catalogue model designation	PLATE No. C-1 — C-4

Bidder's Name AETNA ENGINEERING Co.